Fewtrell, C. (1993) Ca^{2+} oscillations in non-excitable cells. Annu. Rev. Physiol. 55: 427-454.

Fleming, A.H.J. (1994) A numerical estimate of SAR levels in heterogeneous model of the head due to exposure by a mobile phone. 16th Annual BEMS Conf. (abstract) pp 65.

Fleming, A.H.J. and Joyner, K.H. (1992) Estimates of absorption of radiofrequency radiation by the embryo and fetus during pregnancy. Health Physics, 63: 149-159.

Foster, K. R., Epstein, B. R. and Gealt, M. A. (1987),"Resonances" in the dielectric absorption of DNA? Biophys. J. 52: 421-425.

Foster, K.R. and Finch, E.D. (1974) Microwave hearing: Evidence for thermoacoustic auditory stimulation by pulsed microwaves. Science, 185: 256.

Foster, K.R., Stuchly, M.A., Kraszewski, A. & Stuchly, S.S. (1984) Microwave dielectric absorption of DNA in aqueous solution. Biopolymers, 23: 593-599.

Freedman, L.S., Schatzikin, A. and Wax, Y. (1990) The impact of dietary measurement errors on planning sample size required in a cohort study. Am J Epidemiol. 132: 1185-1195.

Frei M.R., Ryan K.L. and Jauchem J.R. (1994) Cardiovascular and thermal effects of radiofrequency irradiation at 1 GHz, 10 GHz, and combined 1 and 10 GHz in anaesthetised rats. 16th Annual BEMS Conf. (poster) pp 149.

Frey, A.H. (1961) Auditory system response to radiofrequency energy. Aerosp. Med. 32: 1140.

Frey, A.H. (1962) Human auditory system response to modulated electromagnetic energy. J. Appl. Physiol. 17: 689.

Frey, A.H. (1963) Some effects on human subjects of ultra-high-frequency radiation. Am. J. Med. Electron., 2: 28.

Frey, A.H. (1988) Evolution and results of biological research with low intensity non ionizing radiation. In: A.A. Marino ed. Modern Bioelectricity Marcel Dekker Inc., New York: 785-836.

Frey, A.H., Feld S.R., Frey, B. (1975) Neural function and behaviour: Defining the relationship. Ann. N. Y. Acad. Sci. 247: 433-439.

Fucic A., Garaj-Vrhovac V., Skara M., Dimitrovic B. (1992) X-rays, microwaves and vinyl chloride monomer: their clastogenic and aneugenic activity, using the micronucleus assay on human lymphocytes. Mutation Res. 282: 265-271.

Gabriel, C. (1988) Localised SAR in people undergoing NMR Imaging. Report prepared for NRPB by University Microwave, London.

Gabriel, C., Grant, E.H., Tata, R., Brown, P.R., Gestblom, B. and Noreland, E. (1989) Dielectric behavior of aqueous solutions of plasmid DNA at microwave frequencies. Biophys. J., 55: 29.

Gabriel, C., Grant, E.H., Tata, R., Brown, P.R., Gestblom, B. and Noreland, E.. (1987). Microwave absorption in aqueous solutions of DNA. Letter to Nature 328: 145-146.

Gabriel, C., Grant, E.H., Tata, R., Brown, P.R., Gestblom, B., Noreland, E. (1989) Dielectric behaviours of aqueous solutions of a plasmid DNA at microwave frequencies. Biophys. J., 55: 29-34.

Galvin, M.J., Ortner, M.J. and McRee, D.I. (1982) Studies on acute in vivo exposure of rats to 2450 MHz microwave radiation. III Biochemical and hematologic effects. Radiat. Res., 90: 558.

Gandhi, O.P. (1987) The ANSI radiofrequency safety standard: Its rationale and some problems. IEEE Eng. in Med. Biol. Mag. pp. 22-25.

Gandhi, P.O. (1990) ANSI. Radiofrequency Safety Guide: Its rationale, some problems and suggested improvements. In: O.P. Gandhi ed. Biological Effects and Medical Applications of Electromagnetic Energy. Biophys. & Bioeng. Series. N.J. Prentice Hall Advanced Reference Series. 29-46.

Garaj-Vrhovac V., Fucic A. (1994) Genetic risk in the occupational exposure to microwave radiation. 16th Annual BEMS Conf. (poster) pp 151.

Garaj-Vrhovac V., Fucic A., and Horvat D. (1992) The correlation between the frequency of micronuclei and specific chromosome aberrations in human lymphocytes exposed to microwave radiation *in vitro*. Mutation Res. 281: 181-186.

Gardner, P. (1989) Calcium and T- lymphocyte activation. Cell, 59: 15-20.

Garner, H.R., Ohkawa, T., Tuason, O. and Lee, R.L. (1990) Microwave absorption in substances that form hydration layers with water, Phys Rev A, 42: 7264-7270.

Garson, M.O., McRobert, T.L., Campbell, L.J., Hocking, B.A. & Gordon, I. (1991) A chromosomal study of workers with long-term exposure to radio-frequency radiation. Med. J. Australia; 155: 289-292.å

Germaine, M.A. Webster, W.S and Edwards, M.J. (1985) Hyperthermia as a teratogen: Parameters determining hyperthermia-induced head defects in the rat. Teratology 31: 265-272.

Gordon, C.J. (1987) Normalizing the thermal effects of radiofrequency radiation: Body mass versus total body surface area. Bioelectromagnetics 8: 111.

Gordon, C.J. (1988) Effect of radiofrequency radiation exposure on thermoregulation. ISI Atlas of Science: Plants and Animals 1: 245-250.

Gordon, C.J. and Ferguson, J.H. (1984) Scaling the physiological effects of exposure to radiofrequency electromagnetic radiation: Consequences of body size. Int. J Radiat. Biol., 46: 387.

Gordon, Z. V. (1966) [Problems of industrial hygiene and the biological effects of electromagnetic superhigh frequency fields.] Moscow, Medicina (in Russian) (English translation in NASA Rep. TT-F-633: 1976).

Goud, G.N., Usha Rani, M.U., Reddy, P.P., Reddi, O.S., Rao, M.S. and Saxena, V.K. (1982) Genetic effects of microwave radiation in mice. Mutat. Res., 103: 39.

Grundler, W and Kaiser, F. (1992) Experimental evidence for coherent excitations correlated with cell growth. Nanobiology, 1: 163-176.

Grundler, W. and Keilmann, F. (1978) Non-thermal effects of millimeter microwaves on yeast growth. Zeitschriff fur Naturforschung, 33C: 15-22.

Grundler, W., Kaiser, F., Keilmann F. and Walleczek J. (1992) Mechanics of electromagnetic interaction with cellular systems. Naturwissenschaften, 79: 551-559.

Guberan, E., Usel, M., Raympond, L., Tissot, R. and Sweetnam, P. M. (1989) Disability, mortality and incidence of cancer among Geneva painters and electricians: A historical perspective study. Br. J. Ind. Med. 46: 16.

Guy, A. W. (1987), Dosimetry associated with exposure to non-ionizing radiation: very low frequency to microwaves. Health Phys. 53: 569-584.

Guy, A.W. (1974) Quantitation of induced electromagnetic field patterns in tissue and associated biologic effects, in Biologic effects and health hazards of microwave radiation Polish Medical Publishers

Guy, A.W. (1984) History of biological effects and medical applications of microwave energy. IEEE Trans. on Microwave Theory & Technique, MTT 32: 1182-1200.

Guy, A.W., Chou, C.K., Kunz, L.L., Crowley, J. and Krupp, J. (1985) Effects of long-term low-level radiofrequency radiation exposure on rats. Volume 9. Summary. Texas, Brooks Air Force Base USAF School of Aerospace Medicine, USFSAM-TR-85-11.

Guy, A.W., Chow, C.K., Lin, J.C. and Christensen, D. (1975) Microwave-induced acoustic effects in mammalian auditory systems and physical materials. Ann. N.Y. Acad. Sci., 247: 194.

Guy, A.W., Kramer, P.O., Harris, C.A. and Chou, C.K. (1980) Long-term 2450 MHz cw microwave irradiation of rabbits: Methodology and evaluation of ocular and physiologic effects. J. Microwave Power 15: 37.

Guy, A.W., Lin, J.C., Kramar, P.O. and Emery, A.F. (1974) Quantitation of microwave radiation effects on the eyes of rabbits at 2450 MHz and 918 MHz. Arlington, Virginia, Office of Naval Research, NTIS AD-A007 521.

Guy, A.W., Lin, J.C., Kramar, P.O. and Emery, A.F. (1975) Effect of 2450-MHz radiation on the rabbit eye. IEEE Trans. Microwave Theory Tech., MTT-23: 492.

Harris, D.T., Kozumbo, W.J., Testa, J.E., Cerutti, P.A. and Cerottini, J.C. (1988) Molecular mechanisms involved in T cell activation. III. The role of extracellular calcium in antigen-induced lymphokine production and interlukin 2-induced proliferation of cloned cytotoxic T- Lymphocytes. J. Immunol. 140: 921-927.

Hill, A.B. (1965) The environment and disease: Association or causation? Proc. R. Soc. Med. 58: 295-300.

Hill, D. A. (1984a) The effect of frequency and grounding on whole-body absorption of human in E-polarized radiofrequency fields. Bioelectromagnetics. 5: 131-146.

Hill, D. A. (1984b) Effect of separation from ground on human whole-body RF absorption rates. IEEE Trans. microwave Theory Tech., MTT-32: 772-778.

Hoth, M. and Penner R. (1992) Depletion of intracellular calcium stores activates a calcium current in mast cells, Nature, 355: 353-355.

Huang, A.T. and Mold, N.G. (1980) Immunologic and hemopoietic alterations by 2450 MHz electromagnetic radiation Bioelectromagnetics, 1: 77.

Huang, A.T., Engle, M.E., Elder, A.J., Kinn, J.B. and Ward, T.R. (1977) The effect of microwave radiation (2450 MHz) on the morphology and chromosomes of lymphocytes. Radio Sci., 12 (S): 173.

Hull, D.S. (1985) Effect of oxygen free radical products on rabbit iris vascular permeability. Acta Ophthal. 63: 513-518.

IEEE (1991) IEEE standard for safety levels with respect to human exposure to radiofrequency electromagnetic fields, 3 kHz to 300 GHz. IEEE C95.1-1991, (New York: IEEE).

INIRC (1991) 1988 guidelines on limits of exposure to radiofrequency electromagnetic fields in the frequency range from 100 kHz to 300 GHz. In: Duchene AS, Lakey JRA. and Rapacholi MH. ed. IRPA guidelines on protection against non-ionizing radiation. Oxford, Pergamon Press, ISBN 0-08-036097-1.

Inouye, M., Galvin, M.J. and McRee, D.I. (1983) Effect of 2450 MHz microwave radiation on the development of the rat brain. Teratology, 28: 413-419.

Inouye, M., Galvin, M.S., McRee, D.I. (1982) Effects of 2.45 GHz microwave radiation on the development of Japanese Quail cerebellum. Teratology; 25: 115-121.

IRPA (1988) International Non-Ionizing Radiation Committee of the International Radiation Protection Association (INIRC-IRPA). Guideline on limits of exposure to radio-frequency electro magnetic fields in the frequency range from 100 GHz to 300 GHz. Health Physics, 54: 115-123.

Jensh, R.P. (1984 a) Studies of the teratogenic potential of exposure of rats to 6 GHz microwave radiation. I. Morphologic analysis at term. Radiat. Res., 97: 282-301.

Jensh, R.P. (1984 b) Studies of the teratogenic potential of exposure of rats to 6 GHz microwave radiation. II. Postnatal psychophysiologic evaluations. Radiat. Res., 97: 282-301.

Jensh, R.P., Vogel, W.H., & Brent, R.L. (1983 a) An evaluation of the teratogenic potential of protracted exposure of pregnant rats to 2450 MHz microwave radiation. I. Morphologic analysis at term. J. Toxicol. Environ. Health, II: 23-35.

Jensh, R.P., Vogel, W.H., & Brent, R.L. (1983 b) An evaluation of the teratogenic potential of protracted exposure of pregnant rats to 2450 MHz microwave radiation. II. Postnatal psychophysiologic analysis. J. Toxicol. Environ. Health, II: 37-59.

Jensh, R.P., Vogel, W.H., W.H. Brent, R.L. (1982 a) Postnatal functional analysis of prenatal exposure of rats to 915 MHz microwave radiation. J. Am. Coll. Toxicol., 1: 73-90.

Jensh, R.P., Weinberg, I., & Brent, R.L. (1982 b) Teratologic studies of prenatal exposure of rats to 915 MHz microwave radiation. Radiat. Res. 92: 160-171.

Johnson, C.C. and Guy, A.W. (1972) Nonionizing electromagnetic wave effects in biological materials and systems. Proc. IEEE, 60: 692-718.

Johnson, R.B., Kunz, L.L., Thompson, D., Crowley, J., Chou, C.K. and Guy, A.W. (1984) Effects of long-term low-level radiofrequency radiation exposure on rats. Volume 7. Metabolism, growth and development. Texas, Brooks Air Force Base, USAF School of Aerospace Medicine, USAFSAM-TR-84-31.

Johnson, R.B., Spackman, D., Crowley, J., Thompson, D., Chou, C.K., Kunz, L.L. and Guy, A.W. (1983) Effects of long-term low-level radiofrequency radiation exposure on rats. Volume 4. Open-field behaviour and corticosterone. Texas, Brooks Air Force Base, USAF School of Aerospace Medicine, USAFSAM-TR-83-42.

Joyner, K.H. Lubinas, V., Wood, M.P., Saribalas, J., Adams, J.A. (1992) Radio frequency radiation (RFR) exposure from mobile phones. Proc. 8th Internat. Congress Internat. Rad. Protection Assoc. (IRPA8), (Montreal, Canada, May 1992). Worldwide Achievement in Public and Occupational Health Protection Against Radiation, Vol 1: 779-782.

Justesen, D.R., Adair, E.R., Stevens, J.C. and Bruce-Wolfe, V. (1982) A comparative study of human sensory thresholds: 2450 MHz microwaves vs far-infrared radiation. Bioelectromagnetics, 3: 117.

Juutilainen, J., Laara., E. and Pukkala, E. (1990) Incidence of leukaemia and brain tumours in Finnish workers exposed to ELF magnetic fields. Arch, Occup. Environ. Health. 62. 289.

Kallen. B., Malmquist, G. and Moritz, U. (1982) Delivery outcome among physiotherapists in Sweden: Is non-ionizing radiation a fetal hazard?, Archives of Environmental Health, 37: 81-84.

Kawanishi, T., Blank, L.M., Haroonunian, A.T., Smith, M.T. and Tsien, R.Y. (1989) Ca^{2+} oscillations induced by hormonal stimulation of individual fura-2-loaded hepatocytes. J. Biol. Chem. 264: 12859-12866.

Kelley, J.T., Everett, R., Reilly, E.L. and Colton G.S. (1984) The relationship between flash evoked potentials and evoked amplitude modulation patterns of an applied UHF electromagnetic field in the rat, Bioelectromagnetics, 5: 365-375.

Kido, D.K., Morris, T.W., Erickson, J.L., Plewes, D.B. and Simon, J.H. (1985) Physiologic changes during high field strength MR imaging. Am. J. Neuroradio., 8: 263.

Kramar, P.O., Emery, A.F., Guy, A.W. and Lin, J.C. (1975) The ocular effects of microwaves on hypothermic rabbits: a study of microwave cataractogenic mechanisms. Ann. N.Y. Acad. Sci., 247: 155.

Kramar, P.O., Harris, C., Emery, A.F. and Guy, A.W. (1978) Acute microwave irradiation and cataract formation in rabbits and monkeys. J. Microwave Power, 13: 239.

Krause, K.H. (1991) Ca^{2+} storage organelles. FEBS Lett. 285: 225-229.

Kues, H.A. and D'Anna, S.A. (1987) Changes in the monkey eye following pulsed 2.45 GHz microwave exposure. 9th Annual Conf. IEEE Engineering in Medicine and Biology Society, Nov. 1987, Boston, Massachusetts. pp. 698.

Kues, H.A., D'Anna, S.A., Johnson, M.A., Green, W.R., Brooks, L.J., and Monahan, J.C. (1994) The importance of specific microwave parameters for the induction of ocular effects in the non-human primate. 16th Annual BEMS Conf. (abstract) pp. 7

Kues, H.A., Hirst, L.W., Lutty, G.A., D'Anna, S.A. and Dunkelberger, G.R. (1985) Effects of 2.45 GHz microwaves on primate corneal endothelium. Bioelectromagnetics, 6: 177.

Kues, H.A., McLeod, D.S., D'Anna, S.A., Lutty, G.A. and Monohan, J.C. (1988) Histological evaluation of microwave-induced vascular leakage in the iris. 10th Annual Conf. BEMS (abstract). pp. 49.

Kues, H.A., McLeod, D.S., D'Anna, S.A., Lutty, G.A. and Monohan, J.C. (1990) Retinal changes in the primate following pulsed 2.45 GHz exposures. 12th Annual Conf. BEMS (abstract) pp. 22.

Kues, H.A., Monahan, J.C., D'Anna, S.A., McLeod, D.S., Lutty, G.A. and Koslov, S. (1992) Increased sensitivity of the non human primate eye to microwave radiation following opthalmic drug pretreatment. Bioelectromagnetics, 13: 379-393.

Kuster, N., Schmid, T., Meier, K. (1993) Laboratory for compliance tests of mobile communications devices with safety standards. 24th Gen. Assembly of International Union of Radio Science (URSI) pp 681.

Lai, H. (1992) Research on the neurological effects of non-ionizing radiation at the University of Washington. Bioelectromagnetics, 13: 513-526.

Lai, H., Carino, M.A., Horita, A., Guy, A.W. (1989) Low level microwave irradiation and central cholinergic systems. Pharmacol. Biochem. Behav. 33: 131-138.

Lai, H., Horita, A., Chou, C.K., Guy, A.W. (1984) Acute low-level microwave irradiation and the actions of pentobarbital: effects pf exposure orientation. Bioelectromagnetics, 5: 203-212.

Lai, H., Horita, A., Chou, C.K., Guy, A.W. (1987 a) A review of microwave irradiation and actions of psychoactive drugs. IEEE Eng. Med. Biol. Mag. 31-36.

Lai, H., Horita, A., Chou, C.K., Guy, A.W. (1987 b) Low level microwave irradiation affects central cholinergic activity in the rat. J. Neurochem. 48: 40-45.

Lai, H., Horita, A., Chou, C.K., Guy, A.W. (1987 c) Effects of low level microwave irradiation on hippocampal and frontal cortical choline uptake are classically conditionable. Pharmac. Biochem. Behav. 27: 635-639.

Lai, H., Horita, A., Guy, A.W. (1988) Acute low level microwave exposure and central cholinergic activity: studies on irradiation parameters. Bioelectromagnetics. 9: 355-362.

Lai, H., Horita, A., Guy, A.W. (1994) Microwave irradiation affects radial-arm maze performance in the rat. Bioelectromagnetics. 15: 95-104.

Lanes, S. (1985) Causal Inference is not a matter for science, Am J Epidemiol. 122;550.

Lary, J.M. and Conover, D.L. (1987) Teratogenic effects of radiofrequency radiation. IEEE Eng. in Med. Biol. Mag. 42-46.

Lary, J.M., Conover, D.L., & Johnson, P.H. (1983 b) Absence of embryotoxic effects from low-level (non-thermal) exposure of rats to 100 MHz radiofrequency radiation. Scand. J. Work Environ. Health, 9: 120-127.

Lary, J.M., Conover, D.L., Foley, E.D., Hanser, P.L. (1982) Teratogenic effects of 27.12 MHz radiofrequency radiation in rats. Teratology 26: 299-309.

Lary, J.M., Conover, D.L., Johnson, P.H., Hornung, R.W. (1986) Dose-response relationship between body temperature and birth defects in radiofrequency-irrated rats. Bioelectromagnetics, 7: 141-149.

Lester, J.R. and Moore, D.F. (1982) Cancer incidence and air force bases, J Bioelectricity. 1: 77-82.

Lewis, R.J. (1990) A case-control comparison interview study of brain tumours and employment in occupation with presumed electric and magnetic field exposures. Houston. Unversity of Texas School of Public Health, Dissertation for degree of Doctor of Philosophy.

Liburdy, R.P. (1977) Effects of radiofrequency radiation on inflammation. Radio Sci., 12(S): 179.

Liburdy, R.P. (1980) Radiofrequency radiation alters the immune system. II. Modulation of *in vivo* lymphocyte circulation. Radiat. Res. 83: 63.

Liburdy, R.P. (1987) Radiofrequency radiation alters the immune system: Modification of T- and B- lymphocyte levels and cell-mediated immunocopetence by hyperthermic radiation. Radiat. Res. 77: 34.

Liburdy, R.P. (1992) The influence of oscillating electromagnetic fields on membrane structure and function: synthetic liposomes and the lymphocyte cell membrane with direct application to the controlled delivery of chemical agents. In: Norden, B & Ramel, C. eds. Interaction mechanisms of low-level electromagnetic fields in living systems. Oxford: Oxford University Press. 259-279.

Liburdy, R.P. (1993) Electromagnetic fields and biomembranes. In: Ho, MW, ed. Bioelectromagnetism and biocommunication. World Scientific Publ. Co. 1-31.

Liburdy, R.P. (1993) Microwave radiation and free radicals: Further evidence for oxygen and free radical involvement in liposome membrane systems. Proc. 15th Annual BEMS Conf. 77-78.

Liburdy, R.P. (1994) Microwave alterations in liposome permeability are mediated by calcium ions and anti-oxidants: Role of electric and magnetic field components. 16th Annual BEMS Conf. Copenhagen (abstract) pp 3.

Liburdy, R.P. and Penn, A. (1984) Microwave bioeffects in the erythrocytes are temperature and $_pO_2$ dependent: Cation permeability and protein shedding occur at the membrane phase transition. Bioelectromagnetics, 5: 283-291.

Liburdy, R.P. and Vanek, P.F. (1987) Microwaves and the cell membrane. 3: Protein shedding is oxygen and temperature dependent: Evidence for cation bridge involvement. Radiation Res. 109: 382-395.

Liburdy, R.P. and Vanek, P.F.. (1985) Microwaves and the cell membrane. 2: Temperature, plasma, and oxygen mediated microwave-induced membrane permeability in erythrocytes. Radiation Res. 102: 190-205.

Liburdy, R.P. and Wyant, A. (1984) Radiofrequency radiation and the immune system. III *In vitro* effects on human immunoglobulin and on murine T- and B- lymphocytes. Int. J. Radiation Biol. 46; 67-81.

Liburdy, R.P., Rowe, A.W. and Vanek, P.F. (1988) Microwaves and the cell membrane. 4: Protein shedding in the human erythrocyte: Quantative analysis by high-performance liquid chromatography. Radiation Res. 114: 500-514.

Lichtman, A.H., Segal, G.B. and Lichtman, M.A. (1983) The role of calcium in lymphocyte proliferation (an interpretive review). Blood 61: 413-422.

Lin, J.C. (1977) On microwave-induced hearing sensation. IEEE Trans. Microwave Theory Tech. MTT 25: 605.

Lin,.R. Dischinger, P.C., Conde, J. and Farrel, K.P. (1985) Occupational exposure to electromagnetic fields and the occurrence of brain tumours. J. Occup. Med 27: 413.

Lin-Liu S., and Adey W.R. (1982) Low frequency amplitude modulated microwave fields change calcium efflux rates from synaptosomes. Bioelectromagnetics. 3: 309-322.

Loomis, D.P. and Savitz, D.A. (1990) Mortality from brain cancer and leukaemia among electrical workers. Br. J. Ind. Med., 47: 633.

Loomis, D.P., Savitz, D.A. and Ananth, C.V. (1993) Case-control study of breast cancer mortality among female electrical workers, presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, Savannah, GA, November 1993.

Lotz, W. G. and Podgorski, R. P. (1982) Temperature and adrenocortical responses in Rhesus monkeys exposes to microwaves. J. Appl. Physiol. Respirat. Environ. Exercise Physiol. 53: 1565-1571.

Lotz, W. G.. (1983) Influence of the circadian rhythm in body temperature on the physiological response to microwaves: Day vs night exposures. In: Adair, E.R. ed. Microwaves and Thermoregulation New York, Academic Press. 445-460.

Lotz, W.G. (1985) Hyperthermia in radiofrequency-exposed Rhesus monkeys: A comparison of frequency and orientation effects. Radiat. Res., 102: 59.

Lotz, W.G. and Michaelson, S.M. (1978) Temperature and corticosterone relationships in microwave-exposed rats. J. Appl. Physiol. Respirat. Environ. Exercise Physiol. 44: 438-445.

Lotz, W.G. and Saxton, J.L. (1989) Membrane permeability in erythrocytes exposed to high peak pulsed microwaves. 11th Annual BEMS Conf. (abstract) P-2-15.

Lovely, R.H., Mizumori S.J.Y., and Guy, A. W. (1983) Subtle consequences of exposure to weak microwave fields: Are there nonthermal effects? In: Adair, E.R. ed. Microwaves and thermoregulation. New York, Academic Press, 401-429.

Lovely, R.H., Myers, D. E. and Guy, A. W. (1977) Irradiation of rats by 918-MHz microwaves at 2.5.mW/cm^2: Delineating the dose-response relationship. Radio Sci. 12: 139-146.

Lovisolo G.A., Raganella L., Nocentini S., Bardati F., Gerardino A., Tognolatti P. (1994) Hand-held cellular telephones: SAR deposition in phantoms. 16th Annual BEMS Conf. (abstract) pp. 65.

Lowenstein, W.R. (1979) Junctional intercellular communication and the control of growth. Biochimica et Biophysica Acta. 560: 1-65.

Maes, A., Verschaeye, L., Arroyo, A., De Wagter, C., Vercruyssen, L. (1993) *In vitro* cytogenetic effects of 2450 MHz waves on human peripheral blood lymphocytes. Bioelectromagnetics, 14: 495-501.

Magnani, C., Coggori, D., Osmond, C. and Acheson,. E.D. (1987) Occupation and five cancers: A case-control study using death certificates. Br. J. Ind. Med, 44, 769.

Maleev, V. Y., Kashpur, V.A., Glibitsky, G.M., Krasnitskaya, A.A. and Yeretelnik, Y.V. (1987) Does DNA absorb microwave energy? Biopolymers, 26: 1965-1970.

Manikowska, E., Luciani, J., Servantie, B., Czerski, P., Obrenovitch, J. and Stahl, A. (1979) Effects of 9.4 GHz microwave exposure on meiosis in mice. Experientia, 35: 388.

Manikowska-Czerka, E., Czerski, P. and Leach, W.M. (1985) Effects of 2.45 GHz microwaves on meiotic chromosomes of male CBA/CAY mice. J. Hered. 76: 71-73.

Marcickiewicz, J., Chazan, B., Niemiec, T., Sokolska, G., Troszynski, N., Luczak, M., & Szmigielski, S. (1986) Microwave radiation enhances teratogenic effect of cytosine arabinoside in mice. Biol. Neonate, 50: 75-82.

Marha, I., Musil, J. and Tuha, H. (1971) Electromagnetic fields and the living environment, San Francisco, San Francisco Press, pp 134.

McAfee, R.D., Longacre Jr, A., Bishop, R.R., Elder, S.T., May, J.G., Holland, M.G. and Gordon, R. (1979) Absence of ocular pathology after repeated exposure of unanaesthetised mo [illegible] 9.3 GHz microwaves. J. Microwave Power, 14: 41.

McDowall, M.E.. (1983) Le[illegible]a mortality in electrical workers in England and Wales. Lancet, 1: 246.

McLauchlan, K. (1992) Are environmental magnetic fields dangerous? Physics World pp 41-45.

McLaughlin, J.K., Malker, H.S.R., Blot,W.J., Malker, B.K., Stone, B.J., Weiner, J.A., Ericsson, J.L.E. and Fraumeni, J. (1987) Occupational risks for intracranial gliomas in Sweden. J. Natl Cancer Inst., 78: 253.

McRee, D.I., MacNichols, G. and Livingston, G.K. (1981) Incidence of sister chromatid exchange in bone marrow cells of the mouse following microwave exposure. Radiat. Res., 85: 340.

Meier, K. and Kuster, N. (1993) Standardized Dosimetric tests of mobile communication devices. 15th Annual BEMS Conf. (abstract) pp 36-37.

Meire K., and Kuster N. (1994) Development of a phantom model for standardised safety compliance tests of mobile communication. 16th Annual BEMS Conf. (abstract) pp. 66.

Meltz M.L. (1991) Physical mutagens. In: Li A. and Heflich R. eds. Genetic Toxicology: A treatise. Caldwell, N.J., The Telford Press. 203-256.

Meltz M.L., Eagen P., Erwin D.N. (1989) Absence of mutagenic interaction between microwaves and mitomycin C in mammalian cells. Environ. Mol. Mutagen. 13: 294-303.

Merritt, J.H., Chamness, A.F., and Allen S.J. (1978) Studies on blood-brain barrier permeability after microwave radiation. Radiat. Environ. Biophys. 15: 367-377.

Merritt, J.H., Hardy, K.A., & Chamness, A.F. (1984) *In Utero* exxposure to microwave radiation and rat brain development. Bioelectromagnetics, 5: 315-322.

Merritt, J.H., Shelton W.W., & Chamness, A.F. (1982) Attempts to alter $Ca\text{-}45^{2+}$ binding to brain tissue with pulse-modulated microwave energy. Bioelectromagnetics. 3: 457-478.

Milham, S. (1988a) Increased mortality in amateur radio operators due to lymphatic and haemotopoietic malignancies. Am. J. Epidemiol., 127, 50.

Milham, S. (1988b) Mortality by license class in amateur radio operators. Am. J. Epidemiol., 128, 1175.

Moe, K.E., Lovely, R.H., Myers, D.E. and Guy, A.W. (1976) Physiological and behavioral effects of chronic low level microwavwe radiation in rats. In Biological Effects of Electromagnetic Waves. Selected Papers of the USNC/URSI Annual Meeting, Boulder, Colorado, October, 1975, Volume 1, pp. 248-256 (Johnson, C.C. and

Shore, M.L. eds). Rockville, Maryland, US Department of Health, Education, and Welfare, HEW Publication (FDA) 77-8010).

Monahan, J.C., Kues, H.A., McLeod, D.S., D'Anna, S.A. and Lutty, G.A. (1988). Lowering of microwave exposure threshold for induction of ocular effects by timolol maleate. , 10th Annual Conf. BEMS. (abstract) pp. 48.

Moolenaar, W.H., Aerts, W.J., Tertoolen, L.G.J. and Delast, S.W. (1986) The epidermal growth-factor induced calcium signal in A431 cells. J. Biol. Chem., 261: 279-285.

Moscovici, B., Lavyel, A. and Ben-itzhac, D. (1974) Exposure to electromagnetic radiation among workers. Fam. Physician, 3(3): 121.

Nawrot, P.S., McRee, D.I. and Staples, R.E. (1981) Effects of 2.45 GHz microwave radiation on embryofetal development in mice. Teratology, 24: 303-314.

NCRP (1981) Radiofrequency electromagnetic fields. Properties, quantities and units, biophysical interactions and measurements. National Council on Radiation Protection and Measurements (NCRP) 79100 Woodmont Ave, Bethesda, MD 20814. Report No. 67.

NCRP (1986) Biological effects and exposure criteria for radiofrequency electromagnetic fields. National Council on Radiation Protection and Measurements, Bethseda, Maryland. Report No 86.

NCRP (1992) Exposure Criteria for Medical Diagnostic Ultrasound: 1. Criteria Based on Thermal Mechanisms. Report no. 113, (National Council for Radiation Protection and Measurements), Bethesda, MD.

NIOSH (1972) Criteria for a recommended standard ... occupational exposure to hot environments. Rockville, Maryland, National Institute for Occupational Safety and Health, US Department of Health, Education and Welfare, NIOSH-TR-004-72.

Noel, N.G. (1989) Cell Signalling. The Guildford Press, NY.

NRPB (1991) Biological effects of exposure to non-ionizing electromagnetic fields and radiation: III Radiofrequency and microwave radiation. (Eds. Saunders, R.D., Kowalczuk, C.I. and Sienkiewicz, Z.J.). NRPB-R240 National Radiological Protection Board, Chilton, Didcot, U.K.

NRPB (1992) Electromagnetic fields and the risk of cancer. Report of an Advisory group on non-ionizing radiation. Vol. 3, No. 1. National Radiological Protection Board, Chilton, Oxford, U.K.

NRPB (1993) Electromagnetic fields and cancer: A review of relevant cellular studies. (Ed. N.A. Cridland) NRPB-R256. National Radiological Protection Board, Chilton, Didcot, U.K.

O'Connor, M.E. (1990) Teratogenesis: Nonionizing electromagnetic fields. In: Gandhi, O.P. ed. Biological Effects and Medical Applications of Electromagnetic Energy. New Jersey; Prentice Hall: 357-372.

O'Connor, M.E. (1980) Mammalian teratogenesis and radio-frequency fields. Proc. IEEE, 68: 56-60.

Olin, R., Vagero, D. and Ahlbom, A. (1985) Mortality experience of electrical engineers. Brit. J. Med. 42: 211-212.

Orcutt, N. and Gandhi, O.P. (1988) A 3-D impedance method to calculate the power deposition in biological bodies subjected to time varying magnetic fields. IEEE Trans. Biomed. Eng., TBE35: 577.

Parker, L.N. (1973) Thyroid suppression and adrenomedullary activation and adrenomedullary activation by low-intensity microwave radiation. Am. J. Physiol. 224: 1388-1390.

Pearce, N., Reif, J. and Fraser, J. (1989) Case-control studies of cancer in New Zealand electrical workers. Int. J. Epidemiol., 18, 55.

Pitot, H.C. and Dragan, Y.P. (1991) Facts and theories concerning the mechanisms of carcinogenesis. FASEB Journal, 5: 2280-2286.

Polk, C. and Postow, E., eds (1986) CRC Handbook of Biologicial Effects of Electromagnetic Fields. CRC, Boca Raton, Florida.

Polson, P. and Merritt, J.H. (1985) Cancer mortality and air force bases: a re-evaluation, J Bioelectricity, 4, 121-127.

Prausnitz S. and Susskind C. (1962) Effects of chronic microwave irradiation on mice. IRE Trans. Biomed. Electron. 9: 104-108.

Preston-Martin, S. Mack, W. and Henderson, B.E. (1989) Risk factors for gliomas and meningiomas in males in Los Angeles County. Cancer Re.5.. 49, 6137.

Prince, J.E., Mori, L.H., Frazier, J.W. and Mitchell, J.C. (1972) Cytologic aspect of RF radiation in the monkey. Aerosp. Med., 43: 759.

Quade, D., Lachenbruch, P.A., Waley, F.S., McClish, D.L. and Haley, R.W. (1980) Effects of misclassification on statistical inferences in epidemiology. Am J Epidemiol ; 111: 503-515.

Ragan, H.A., Phillips, R.D., Buschbom, R.L., Busch, R.H. and Morris, J.E. (1983) Hematologic and immunologic effects of pulsed microwave in mice. Bioelectromagnetics, 4: 383-396.

Rama Rao, G., Cain, C.A., Lockwood, J. and Tompkins, W.A.F. (1983) Effects of microwave exposure on the hamster immune system. I Natural killer cell activity. Bioelectromagnetics, 4: 141-155.

Ramaiaiya, L.K., Pomerantseva, G.A., Vilkina, G.A. and Tikhonchuk, V.S. (1980) Study of the action of UHF microwaves on mammalian germ and somatic cells. Tsitologiya i Genetika, 14: 3.

Rhee, K.W., Lee, C.S., Davis, C. C., Sagripanti, J.L. and Swicord, M.L. (1988) Further studies of the microwave absorption characteristics of different forms of DNA in solution . 10th Annual BEMS Conf.Stamford, Connecticut (abstract) pp.17.

Roberts, N.J. Jr, Michaelson, S.M. and Lu, S.T. (1986) The biological effects of radiofrequency radiation: A critical review and recommendations. Int. J. Radiat. Biol. , 50: 379-420.

Roberts, N.J. Jr. (1983) Radiofrequency and microwave effects on immunological and hematopoietic systems. In: M Grandolfo, SM Michaelson and A Rindi, eds. Biological Effects and Dosimetry of Non ionizing Radiation, Radiofrequency and Microwave Energies. New York, Plenum Press. pp. 429-459.

Robertson B., and Astumian R.D. (1992) Frequency and amplitude dependance of the effect of a weak oscillating field on biological systems. In: MJ Allen, SF Cleary, AE Sowers, and DD Shillady, eds. Charge and field effects in biosystems -3. Boston, Birkhauser, 439-448.

Rodier, P.M. (1992) Critical periods for morphological assessment. Congenital Anomalies. 32, S55-S64.

Rosenthal, S.W., Birenbaum, L., Kaplan, I.T., Metlay, W., Snyder, W.Z. and Zaret, M.M. (1976) Effects of 35 and 107 GHz cw microwaves on the rabbit eye. In: Biological Effects of Electromagnetic Waves. Selected Papers of the USNC/URSI Annual Meeting, Boulder, Colorado, October, 1975, Volume 1 (eds. CC Johnson and ML Shore). Rockville, Maryland, US Department Health, Education and Welfare, HEW Publication (FDA) 77-8010, pp. 110.

Rossier, M.F. and Putney Jr. J.W. (1991) The identity of the calcium storing, inositol 1, 4, 5 - trisphosphate-sensitive organelle in non-muscle cells: Calciosome, endoplasmic reticulum or both? Trends Neurosci., 14: 310-314.

Rothman, K.J. (1986) Modern Epidemiology, Little Brown and Co, Boston.

SAA (1990) Standards Association of Australia. Radio-frequency radiation Part 1. Maxium exposure levels - 100 KHz to 300 GH2. AS2772.1; 1990.

Saito, K., and Suzuki, K. (1993) Biological effects of radiofrequency radiation on chick embryo. Abstract from 33rd Annual Meeting Japanese Teratology Soc., Nagoya, 1993. Teratology 48: B-64, pp. 514.

Saito, K., Goto, N., Ogasawara, T., Imamura, K., Isoda, M. (1987) Growth pattern of several organs in mice under low-level RF exposure. J. Growth, 26: 69-73 (in Japanese).

Saito, K., Kajigaya, H., Imamura, K., Goto, N., Isoda, M. (1986) The effect of low-level RF exposure on the growth and reproduction in mice. J: Growth, 25: 39-45 (in Japanese).

Saito, K., Suzuki, K. and Motoyoshi, S. (1991) Lethal and teratogenic effects of long-term low intensity radiofrequency radiation at 428 MHz on developing chick embryo. Teratology, 43: 609-614.

Salford, L.G., Brun, A., Eberhardt, J.L., Malmgren, L., and Persson, R.R. (1992) In: C. Ramel and B. Norden eds. Interaction mechanism of low-level electromagnetic fields in living systems. Oxford University Press.

Salford, L.G., Brun, A., Eberhardt, J.L., Persson, R.R. (1993) Pemeability of the blood-brain barrier induced by 915 MHz electromagnetic radiation, continuous wave and modulated at 8, 16, 50 and 200 Hz. Bioelectochem. and Bioenergetics, 30: 293-301.

Sarkar S., Ali S., and Behari J. (1994) Effect of low power microwave on the mouse genome: A direct DNA analysis. Mutation Res. 320: 141-147.

Saunders, R.D., Kowalczuk, C.I. and Sienkiewicz, Z.J. (1992) Biological effects of exposure to non-ionizing electromagnetic fields and radiation: III, Radiofrequency and microwave radiation, NRPB Report NRPB-R240 (London:HMSO).

Saunders, R.D., Kowalczuk, C.I., Beechey, C.V., and Dunford, R. (1988) Studies of the induction of dominant lethals and translocations in male mice after chronic exposure to microave radiation. Int. J. Radiat. Biol. 53: 983-992.

Saunders, R.R.D., Darby, S.C. and Kowalczuk, C.I. (1983) Dominant lethal studies in male mice after exposure to 2.45 GHz microwave radiation. Mutat. Res., 117: 345.

Schaefer, D.J., Barber, B.J., Gordon, C.J., Zielonka, J. and Hecker, J. (1985) Thermal effects of magnetic resonance imaging (MRI). In: Abstracts, Society of Magnetic Resonance Imaging in Medicine. Volume 2. Berkeley, California, Society of Magnetic Resonance in Medicine. pp. 925.

Schlagel, C.J., and Ahmed, A. (1982) Evidence for genetic control of microwave-induced augmentation of complement receptor-bearing B lymphocytes. J. Immunol. 129: 1530-1535.

Schlagel, C.J., Sulek, K., Ho, H.S., Leach, W.M., Ahmed, A., and Woody, J.N. (1980) Biological effects of microwave exosure. 2. Studies on the mechanisms controlling susceptibility to microwave-induced increases in complement receptor-positive spleen cells. Bioelectromagnetics. 1: 405-414.

Schwartz, J.L., House, D.E. and Mealing, G.A.R. (1990) Exposure of frog hearts to cw or amplitude-modulated VHF fields: Selective efflux of calcium ions at 16 Hz. Bioelectromagnetics, 11: 349-358.

Serdjuk, A.M. (1977) [Interaction of the organism and environmental electromagnetic fields.] Kiev, Naukova Dumka, pp.172 (in Russian).

Shellock, F.G. and Crues, J.V. (1987) Temperature, heart rate, and blood pressure changes associated with clinical MR imaging at 1.5 T. Radiology, 163: 259.

Shellock, F.G., Schaefer, D.J. and Crues, J.V. (1989) Alterations in body and skin temperatures caused by magnetic resonance imaging: Is the recommended exposure for radiofrequency radiation too conservative? Br. J. Radiol. 62: 904.

Shelton, W.W. and Merritt, J.H. (1981) *In vitro* study of microwave effects on calcium efflux in rat brain tissue. Bioelectromagnetics. 2: 161-167.

Sheppard, A.R., Bawin, S.M. and Adey, W.R. (1979) Models of long-range order in cerebral macromolecules: Effects of sub-ELF and of modulated VHF and UHF fields. Radio Sci., 14(S): 141-145.

Sienkiewicz, Z.J., Cridland, N.A., Kowalczuk, C.I., Saunders, R.D. (1993) Biological effects of electromagnetic fields and radiation. In: W.R. Stone, G. Hyde, eds. The Review of Radio Science 1990-1992. Oxford University Press. 737-770.

Simon, E., Pierau, F.K. and Taylor, D.M.C. (1986) Central and peripheral thermal control of effectors in homeothermic temperature regulation. Physiol. Rev., 66: 235.

Skidmore, W.D. and Baum, S.J. (1974) Biological effects in rodents exposed to 10^8 pulses of electromagnetic radiation. Health Phys., 26: 391.

Smialowicz, R.J. (1984) Hematologic and immunologic effects. In: JR Elder and DF Cahil eds. Biological Effects of Radiofrequency Radiation. North Carolina, Health Effect Research Laboratory, US Environmental Protection Agency, EPA-600/8-83-026F. 5-13.

Smialowicz, R.J., Ali, J.F., Berman, E., Bursian, S.J., Kinn, J.B., Liddle, C.G., Reiter, L.W. and Weill, C.M. (1981) Chronic exposure of rats to 100 MHz (cw) radiofrequency radiation: Assessment of biological effects. Radiat. Res., 87: 488-505.

Smialowicz, R.J., Brugnolotti, P.L. and Riddle, M.M. (1981 c) Complement receptor positive spleen cells in microwave (2450 MHz) - irradiated mice. J. Microwave Power. 16: 73-77.

Smialowicz, R.J., Kinn, J.B. and Elder, J.A. (1979 b) Perinatal exposure of rats to 2450 MHz cw microwave irradiation of rabbits: Evaluation of hematological and immunological effects. J. Microwave Power, 15: 45.

Smialowicz, R.J., Riddle, M.M., Brugnolotti, P.L., Sperrazza, J.M. and Kinn, J.B. (1979) Evaluation of lymphocyte function in mice exposed to 2450 MHz (cw) microwaves. In: Stuchly SS ed. electromagnetif Fields in Biological Systems. Edmonton, Alberta, International Microwave Power Institute. 122-152.

Smialowicz, R.J., Rogers, R.R., Garner, R.J., Riddle, M.M., Luebke, R.W. and Rowe, D.G. (1983) Microwave (2450 MHz) suppress murine natural killer cell activity. Bioelectromagnetics, 4: 371-381.

Smialowicz, R.J., Weil, C.M., Kinn, J.B. and Elder, J.A. (1982) Exposure of rats to 425 MHz (cw) radiofrequency radiation: Effects on lymphocytes. J. Microwave Power, 17: 211-221.

Smialowicz, R.J., Weil, C.M., Marsh, P., Riddle, M.M., Rogers, R.R. and Rehnberg, B.F. (1981 a) Biological effects of long-term exposure of rats to 970 MHz radiofrequency radiation, Bioelectromagnetics. 2: 279-284.

Speers, M.A., Dobbins, J.G. and Van Miller, S. (1988) Occupational exposure and brain cancer mortaility: A preliminary study of East Texas residents. Am. J. Ind. Med. 13: 629.

Spiegel, R.J., Fatmi, M.B.E., Stuchly, S.S. and Stuchly, M.A. (1989) Comparison of finite difference time domain SAR calculations with measurements in a heterogeneous model of man. IEEE Trans. Biomed. Eng. BME-36, 849.

Stagg, R.B., Thomas, W.J., Adey, W.R. (1994) DNA synthesis and cell proliferation in C6 glioma and primary glial cells exposed to a 837 MHz modulated radiofrequency field. Proc. 16th Annual Conference BEMS (abstract) A-1-6.

Stather, J.W. (1992) Electromagnetic fields and the risk of cancer. Report of an advisory group on non-ionizing radiation. Radiol. Protection Bulletin, 131: 8-14.

Stern, F.B. Waxweiler, R.A., Beaumont, J.J., Lee. S.T., Rinsky, R.A., Zukmwalde, F.D. Halperin, W.E., Bie-raum, P.J., Landrigan, P.J. and Murray, W.E. (1980) A case-control study of leukaemia at a naval nuclear shipyard. Am. J. Epidemiol. 123: 980 .

Strather, J.W. (1992) Electromagnetic fields and the risk of cancer. Radiological Protection Bulletin, No.131: 8-14.

Stuchly, M.A., Repacholi, M.H., Lecyer, D.W. and Mann, R.D. (1982) Exposure to the operator and patient during shortwave diathermy treatments. Health Physics. 42: 341-366.

Stuchly, M.A., Stuchly, S.S., Liburdy, R.P., Rousseau, D.A. (1988) Dielectric properties of liposome resides at the phase transition. Phys. Med. Biol. 33: 1309-1324.

Swicord, M.L. and Davis, C.C. (1982) Microwave absorption of DNA between 8 and 12 GHz. Biopolymers, 21: 2453-2460.

Swicord, M.L., Edwards, G.S., Sagripanti, J.L., Davis, C.C. (1983) Chain-length-dependent microwave-absorption of DNA, Biopolymers. 22: 2513-2516.

Szmigielski, S. (1994) Cancer morbidity during the 20 year period (1970-1989) in Polish military personnel exposed occupationally to radiofrequency and microwave radiation. 16th Annual Meeting BEMS Conf. Copenhagen (abstract).

Szmigielski, S., Lipski, M.B.S., Sokolska, G. (1988) Immunologic and cancer-related aspects of exposure to low-level microwave and radiofrequency fields. In: A.A. Marino. ed. Modern Bioelectricity. Marcel Dekker Inc., New York: 861-925.

Szmigielski, S., Szudzinski, A., Pietraszek, A., Bielee, M., Janiak, M., Wrembel, J.K. (1982) Accelerated development of spontaneous and benzopyrene-induced skin cancer in mice exposed to 2450 MHz microwave radiation. Bioelectromagnetics, 3: 179-191.

Takahashi, K., Kaneko, I., Date, M., Fukada, E. (1986) Effect of pulsing electromagnetic fields on DNA synthesis in mammalian cells in culture. Experientia, 42: 185.

Tarantal, A.F.; Hendrickx, A.G. (1989) Evaluation of the bioeffects of prenatal ultrasound exposure in the Cynomolgus Macaque (Macaca fascicularis): I. Neonatal/infant observations. Teratol. 39: 137-147.

Tell, R.A. and Harlen, F. (1979) A review of selected biological effects and dosimetric data useful for development of radiofrequency safety standards for human exposure. J. Microwave Power, 14: 405-424.

Thomas, T.L., Stolley, P.D., Stemhgen, A., Fontham, E.T.H., Blecker, M.L., Stewart, P.A. and Hooever, R.N. (1987) Brain tumour mortality risk among men with electrical and electronics jobs: a case- control study, JNCI 79: 233-238.

Tofani, S., Agnesod, G., Ossola, P., Ferrini,, S., Bussi, R. (1986) Effects of continuous low-level exposure to radiofrequency radiation on intrauterine development in rats. Health Physics, 51: 489-499.

Toler, J., Popovic, V., Bonasera, S., Popovic, P., Honeycutt, C. and Sgoutas, D. (1988) Long-term study of 435 MHz radio-frequency radiation on blood-borne end points in cannulated rats. Part II: Methods, results and summary. J. Microwave Power. 23: 105-136.

Tyndall, D.A., Sulik, K.K. (1991) Effects of magnetic resonance imaging on eye development in the C57BL/6J mouse. Teratology, 43: 263-275.

Tynes, T., Hanevik, M., Vistues, A.I. (1994) Incidence of cancer in Norwegian female radio and telegraph operators. 16th Annual BEMS Conf. (abstract) pp 46.

UNSCEAR (1986). United nations scientific committee on the effect of atomic radiation, ionizing radiation: Sources and biological effects. United Nations, New York.

Vägerö, D. and Olin, R. (1983) Incidence of cancer in the electronics industry: Using the new Swedish Cancer Environment Registry, Br. J. Ind. Med. 40: 188.

Vägerö, D., Ahlbom, A., Olin, R. and Ahlsten, S. (1985) Cancer morbidity among workers in the telecommunications industry. Br. J. Ind. Med. 42: 191.

Varma, MM., and Traboulay, EA. (1976) Evaluation of dominant lethal test and DNA studies in measuring mutagenicity caused by non-ionizing radiation. In: CC Johnson and ML Shore eds. Biological effects of electromagnetic waves. HEW Publ. No. FDA 77-8010, Washington, D.C.

Verschaeye, L., Maes, A., Van Gorp, U., Collier, M., Slaets, O. (1994) Genetic effects associated with microwaves from mobile telephone frequencies. 16th Annual BEMS Conf.(abstract) pp. 5.

Walleczek, J (1992) Electromagnetic field effects on cells of the immune system: the role of calcium signalling. FASEB Journal 6; 3176-3185.

Walsh, D. A.; Klein, N. W.; Hightower, L. E.; Edwards, M. J. (1987) Heat shock and thermotolerance during early rat embryo development. Teratology, 36: 181-191.

Walsh, D.A., Hightower, L.E., Klein, N.W. & Edwards, M.J. (1985) The induction of heat shock protein during early mammalian development. Heat Shock (Cold Spring Harbour Symposium, Aug 28-Sep. 1) 2:92.

Ward, TR., and Ali, JS. (1985) Blood-brain barrier permeation in the rat during exopsure to low-power 1.7 GHz microwave radiation. Bioelectromagnetics. 6: 1313.

Warkany, J. (1986) Teratogen update: Hyperthermia. Teratology, 33: 365 -371.

Weiss, A., and Imboden, JB. (1987) Cell surface molecules and early events involved in human T- lymphocyte activation. Adv. Immunol. 41: 1-38.

WFUMB (1992) World Federation for Ultrasound in Medicine and Biology Symposium on Safety and Standardisation in Medical Ultrasound: - Issues and recommendations regarding thermal mechanisms for biological effects of ultrasound. Barnett, S.B. and Kossoff, G., eds. Ultrasound Med. Biol. 18: No. 9 (special issue).

Whittemore, A.S. (1978) Quantitative theories on oncogenesis. Adv. Cancer Res. 17: 55-88.

WHO (1980) Radiofrequency and microwaves. Geneva, World Health Organisation Environmental Health Criteria 16.

WHO (1993) Electromagnetic fields (300 Hz to 300 GHz). Environmental Health Criteria 137. World Health Organisation, Geneva. ISBN 924157137 3.

Wiklund, K., Einhorn, J. and Eklund, G. (1981) An application of the Swedish Cancer-Environment registry. Leukemia among telephone operators at the Telecommunications Administration in Sweden. Int. J. Epidemiol. 10: 373-6.

Wiktor-Jedrzejczak, W., Ahmed, A., Sell, K.W., Czerski, P. and Leach, W.M. (1977) Microwaves induce an increase in the frequency of complement receptor-bearing lymphoid spleen cells in mice. J. Immunol. 118: 1499-1502.

Wiktor-Jedrzejczak, W., Ahmed. A., Czerski, P., Leach, W.M. and Sell, K.W. (1980) Effect of microwaves (2450 MHz) on the immune system in mice: Studies of necleic acide and protein synthesis. Bioelectromagnetics, 1: 161-170.

Williams, WM., Lu, S-T., Del Cerro, M., and Michaelson, SM. (1984) Effect of 2450 MHz microwave energy on the blood-brain barrier to hydrophilic molecules. D. Brain temperature and blood-brain barrier to hydrophilic tracers. Brain Res. Rev. 7: 191-212.

Wood, A.W., Lubinas, V., Joyner, K.H. and Hocking, B.A. (1993) Calcium efflux from toad heart: A replication study. In: M Blank. ed. Electricity and Magnetism in Biology and Medicine. San Francisco Press, Inc., USA 482-484.

Yang, H.K., Cain, C.A., Lockwood, J. and Tompkins, W.A.F. (1983) Effects of microwave exposure on the hamster immune system. I Natural killer cell activity. Bioelectromagnetics, 4: 123.

Zaret, M.M. (1988) Electromagnetic energy and cataracts. In: A.A. Marino. Ed. Modern Bioelectricity. Marcel Dekker Inc., New York: 839-859.

Zhang, C.T. (1989) Harmonic and subharmonic resonance of microwave absorption in DNA. Phys. Rev. A. 40: 2148-2153.

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A Case For Reducing Human Exposure Limits Based On Low-Level, Non-Thermal Biological Effects

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RADIOFREQUENCY RADIATION EXPOSURE STANDARDS
IN AUSTRALIA AND NEW ZEALAND
100KHz - 300GHz

A CASE FOR REDUCING HUMAN EXPOSURE LIMITS BASED ON LOW LEVEL, NON THERMAL, BIOLOGICAL EFFECTS.

PART ONE

January 1994

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Introduction

"the proper course to adopt in setting a standard of this kind, where the effects of "low" levels of radiation are largely controversial is to give first priority to the safety of people...."

Dr David Hollway
CSIRO National Measurement Labs

It took Dr David Hollway of CSIRO's National Measurement Laboratories many years of patient and sustained work but he was instrumental in the Standards Association finally establishing in 1985 the first Australian safety standard which set limits on exposure to radiofrequency radiation for the general population and for workers. Up until that time the standard that had loosely prevailed in Australia was the US Standard. The new Australian standard not only set more stringent limits for workers, reducing the allowable exposures from 10 mW/cm2 down to 1 mW/cm2 but also established a limit for the general population.

On the committee which met for seven years Hollway was outnumbered by the representatives of those interests which were fundamentally opposed to any restrictions and who as a matter of course denied and minimised all of the published evidence of harm. Getting agreement was not an easy matter. The disagreements were deep and the thousands of scientific papers in the international literature were then and still are divided on the issues of how these forms of radiation interact with living systems and on what could be considered a "safe" dose. The US standard was based on limiting, but not eliminating the heating effects of these forms of radiation, standards in Russia and throughout the eastern bloc countries were based on preventing more subtle effects on the nervous and endocrine system which, it was claimed, overtime, led to ill health.

The two schools of thought about the biological and health effects of microwave radiation safety, the thermal and the non thermal models were difficult but not impossible to reconcile so while the resulting first Australian standard was basically a thermal standard it was also at least cognisant of the possibility that the more subtle effects could not be entirely discounted, and in an unusual step for a western country, Australia began the process of taking these non thermal effects into account and set established tougher limits than the US.

It is interesting to note that while these more stringent safety limits provided greater protection for working people these more stringent limits did not cause the nations meteorological or defence radars to become inoperable, nor did the various airport radars cease to work. The telecommunications systems continued to function including all of the telephone links, TV and radio stations and whole new technologies like the mobile phone have been introduced. It can hardly be argued that the Australian standard with its greater margin of safety has curtailed the development of these industries. In fact the industries have a very large comfort zone to operate within already and as far as Dr Hollway was concerned the margin of safety for the general population was insufficient.

Dr. David Hollway was critical of the 1985 Australian standard for not providing a sufficiently large safety margin for the general population and urged this be addressed in future reviews but he also pointed to the aspects for workers that were very good and which should be adopted in international standards.

The standard adopted in 1985 is now "under review". As John Adams of the US National Institute of Standards and Technology has recently noted in an article examining the power output of various types of communication equipment there have been increases in the power of radiating antenna which meant some exceeded safety standards.

> *A decade ago most of these radios generated between 1 and 2 Watts of output power. In the past few years however transceivers that produce as much as 5 or 6 Watts have become available and are used as a means of improving communication range and system reliability. Unfortunately a by-product of this enhanced capability is an increase of field strengths in the vicinity of the transceiver and its antenna.* [1]

This is one source of the push to water down safety limits. The excellent features of the Australian standard are under attack and there are moves to return to the higher levels of the 1960's and 70's. It is worth recalling what Hollway saw coming;

> *A virtue of this standard is that it recognises that the ANSI(US) limit of 5mW/cm2 in the microwave range does not provide an adequate safety factor to protect workers against non uniform heating (hot spots) and accidental focussing and reflections from metal surfaces. A level of 5mW/cm2 would allow 50 watts to fall on each square metre, amounting to perhaps thousands*

of watts over a working area. When it is remembered that only one half watt entering a human eye can cause a cataract in a fairly short time and that microwaves can be strongly concentrated by reflection and focussed by metal surfaces the advantages of the lower Australian level can be appreciated. The standard includes an absolute limit to the allowable limit to the allowable peak power density (1000mw/cm2) . In this respect it is an improvement upon the current ANSI standard which would allow remarkably high levels...[2].

He went on to warn of the attempts that are now being made to weaken the protection that has been established in Australia and how this attack on Australian conditions would be dressed up.

As the good features listed above are departures from the ANSI standard , there is a danger of there being removed in some future revision on the pretext of compliance with standards in use overseas. The community should be on guard against this....

Is it over optimistic to hope that instead of taking this retrograde step, the Standards Association, through its representation on international bodies will be able to convince other countries that they should adopt the good features of the Australian standard?[3]

"Electromagnetic radiation is one of the forms in which matter exists. There is no rigid boundary between matter and radiation. It has been proven experimentally that certain elementary particles on interacting with one another, for example, an electron and a positron are transformed into electromagnetic radiation of a certain wavelength and conversely that elementary particles can be produced from an electromagnetic field." [4]

WHO IS EXPOSED

In this document we address only those parts of the electromagnetic spectrum 100KHz to 300GHz, the radio frequency frequencies commonly used in radar, telecommunications and industry and in medical and scientific applications.

NIOSH estimated that in 1980 there were 21,062,000 American workers potentially exposed to radiofrequency and radiofrequency radiation.[5]

The major occupationally exposed groups include all those using radiofrequency heaters, sealers and drying equipment. This equipment has been the subject of NIOSH hazard alerts in the past and was found to be considerably over exposing workers.[6] In Australia RF heater sealer workers were acknowledged by Joyner to similarly be overexposed and ignorant of the risks to their health.[7]

There are also other workers exposed to intense radio frequency fields in the metals industry where radio frequency radiation is used as the heat source in furnaces. These are recognised as being among the most intensely exposed of all exposed workers. [8]

We do not address specifically the Extremely Low Frequency part of the spectrum used in the distribution of electrical power but we urge the review of existing woefully inadequate guidelines and the development of standards for the ELF part of the spectrum in the light of substantial evidence associating an increased risk of cancers in both the general public, particularly children, and among workers who are occupationally exposed.

RF EXPOSED WORKERS INCLUDE THE FOLLOWING:

Automotive workers

- drying of trim base panels
- embossing of heel pads to carpets
- heat sealing body interior trim panels
- heat sealing vinyl and convertible roofs
- heat sealing seats

Furniture and Wood Workers

- decking assembly
- door lamination
- fibreboard fabrication
- fibreboard or plywood scarf gluing
- plywood panel patching
- ski lamination
- veneer panel gluing

Glass Fibre Workers

- drying and curing work

Paper Product Workers

- drying resin coatings
- heating coatings on continuous webs
- gluing paper
- correcting moisture profiles on continuous webs

Plastic heating and sealing

- countless wrapping and sealing products from plastic gloves to oxygen tents, pharmaceuticals, food packages, baby pants and nappies etc ,

RF Radiofrequency Application Workers

- Advertising RF excited gas display signs
- ceramics drying
- chemicals activation of chemical processes